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US 6353778 B1

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(54) Abstract Title: **Detecting Position of Use of a Mobile Telephone**

(57) A method for detecting that a vehicle driver is using a mobile telephone while the vehicle is in motion. The method comprising the steps of determining that a voice-call is in progress, determining that the vehicle is in motion, and detecting that the mobile terminal is held in one of two ways that suggest that the user is driving. These include holding the phone between the users shoulder and ear or holding the phone by the vehicle controls. The first position can be detected by pressure sensors, which may be piezoelectric elements, or the keypad or touch-screen may be used to sense pressure. The second position can be detected by a proximity sensor, or by acceleration sensors which monitor movement of the phone towards the vehicles controls. Pressure detected in the phone casing can also be used to control the volume of the speaker or microphone of the phone.

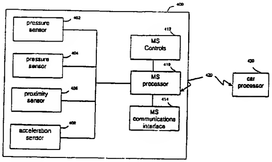

Fig. 7

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Fig. 1

Fig. 2

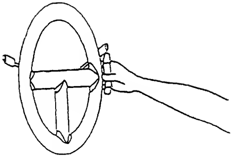


Fig. 3

Fig. 4

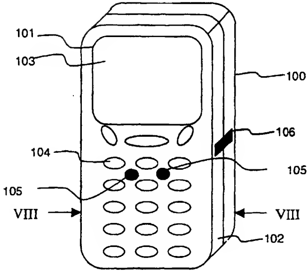
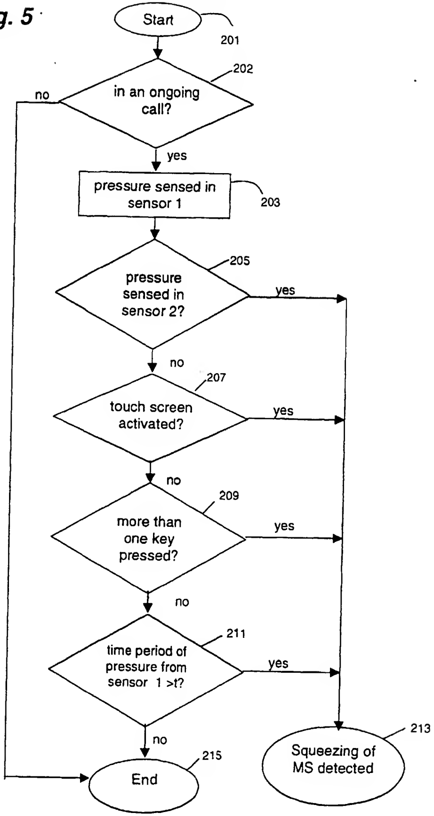
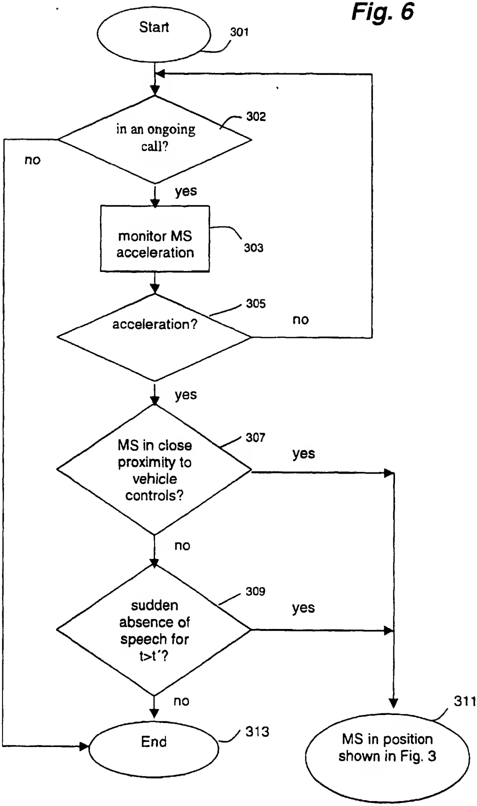


Fig. 5



Start
201
in an ongoing call?
202
no
yes
pressure sensed in sensor 1
203
pressure sensed in sensor 2?
205
yes
no
touch screen activated?
207
yes
no
more than one key pressed?
209
yes
no
time period of pressure from sensor 1 >t?
211
yes
no
End
215
Squeezing of MS detected
213

Fig. 6



Start
301
in an ongoing call?
302
no
yes
monitor MS acceleration
303
acceleration?
305
no
yes
MS in close proximity to vehicle controls?
307
yes
no
sudden absence of speech for t>t′?
309
yes
no
End
313
MS in position shown in Fig. 3
311

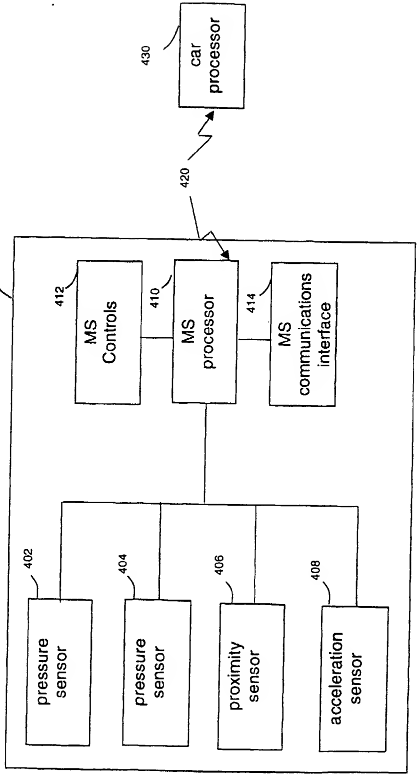

430
car processor
420
400
412
MS Controls
410
MS processor
414
MS communications interface
402
pressure sensor
404
pressure sensor
406
proximity sensor
408
acceleration sensor

Fig. 7

Fig. 8

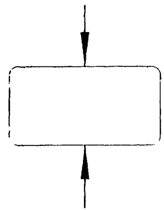


Fig. 9A

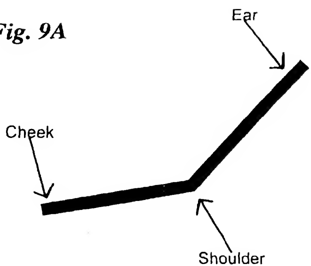
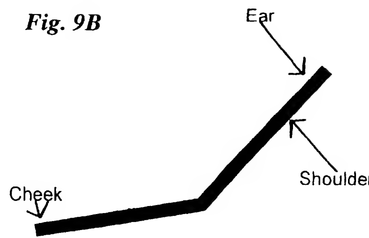


Fig. 9B



Usage Position Detection

The present invention relates to the field of mobile communications devices. More particularly, but not exclusively, the invention relates to a system and method for reliably detecting that a user of a mobile communications terminal is holding the terminal in an unusual position, i.e. a position other than holding the terminal with a hand close to the user's head. Such a method is for example useful for detecting that a driver of a vehicle is using a mobile terminal whilst the vehicle is in motion.

In recent years, mobile terminals communicating via a mobile communications network have come into widespread use. More and more people are using such terminals in many situations, including in vehicles while they are driving.

It is known and supported by recent investigations such as a recent Transport Research Laboratory (TRL) investigation that the act of communicating via a mobile terminal whilst driving a vehicle is detrimental to the quality of driving. In many countries the use of mobile terminals while driving is not allowed. In other countries the use of "hands-free" mode is compulsory, which allows a driver to communicate via a mobile terminal without requiring operation of the mobile terminal by using his hands.

However, many people do not use hand-free mode while driving, but hold the mobile terminal in one hand whilst driving a car, or balance it on their shoulder.

There are methods and systems known in the art which alert drivers of vehicles who use mobile communication devices whilst driving that doing so might be dangerous.

Japanese patent application JP 10138791 relates to a device for warning a driver using a mobile communications device in a hands-free mode. The system comprises a CCD camera for obtaining image data from the eyes of the driver. The image data are processed so as to determine the direction of sight of the driver. A warning is issued when it is determined that the driver faces only in one direction for a long time or faces in a direction other than a driving direction for a long time.

Japanese patent applications JP 1024076 and JP 2001238257 relate to systems for alerting a user or limiting the use of a mobile terminal when the mobile phone is moving at a high speed. This is achieved by detecting a frequency shift (Doppler shift) resulting from the speed of a moving vehicle and by analysing the time period of the mobile terminal communicating with the different base stations of the mobile communications networks, respectively.

However, these systems have the disadvantage that they alert the user or even limit the use of a mobile terminal even if a passenger moving in a vehicle, but not driving the vehicle, is using a mobile terminal.

British patent application GB 2345569 relates to a system for alerting a driver of a vehicle when the vehicle operator is using a mobile terminal or

the vehicle operator is expected to use a mobile terminal and the driving of the vehicle is unstable or expected to become unstable.

In order to determine whether the driver of a vehicle is using a mobile terminal the system relies on image information of a CCD camera. The judgement whether driving is unstable or becoming unstable is made by obtaining data like, for example, steering angle data, or acceleration data, or by comparing current running data of the vehicle with recorded running data.

However, image recognition is a difficult and resource consuming operation. In addition, the method used for judging the driving of the vehicle requires means for sensing, recording and processing image data, which is costly and resource consuming.

It is thus an aim of the present invention to alleviate the disadvantages described above.

It is another aim of the present invention to detect that a user is holding a mobile communications terminal in an unusual position.

It is another aim of the present invention to provide a system for detecting that a vehicle driver is using a mobile communications terminal whilst operating a vehicle.

According to one aspect of the present invention, there is provided a method for detecting that a vehicle driver is using a mobile communications terminal while the vehicle is in motion, the method comprising the steps of

i) determining that a voice-call is in progress; ii) determining that the vehicle is in motion; and iii) detecting that the mobile terminal is used in an unusual position.

In this way it is possible to detect that a driver of a vehicle in motion is using a mobile terminal in an ongoing voice-call.

Preferably, at least one of the following situations is detected: It is determined whether a user is squeezing the terminal, for example between the user's head and shoulder, by sensing pressure exerted on the mobile terminal; it is determined whether the terminal is situated in close proximity to the vehicle's controls and/or steering wheel; or it is determined whether the terminal is moved away from a position beneath the user's head. In this way it is possible to detect the two most commonly used methods of operating controls in a moving vehicle while using the mobile terminal in an ongoing voice-call.

According to another aspect of the present invention, there is provided a system for detecting that a user of a mobile communications terminal holds the terminal in a position other than with a hand close to the user's head, the system comprising: at least one sensor for sensing the pressure exerted on the mobile terminal; and a processor for processing the information obtained from said at least one sensor.

Preferably, the system further comprises a proximity sensor for sensing the proximity of said mobile terminal to other devices and/or a motion sensor sensing a movement of the mobile terminal.

According to another aspect of the present invention, there is provided a method of determining the way a user holds a mobile terminal by detecting pressure on the case and/or on operational elements of a mobile terminal.

In this way the position of a mobile terminal can be determined and the operation of the mobile terminal can be adapted according to the way the terminal is held or other action can be taken as a response to the detection of the way the terminal is held.

According to another aspect of the present invention, there is provided a method of determining a change in the way a user holds a mobile terminal by detecting a movement of a mobile terminal.

Other aspects and advantages of the present invention will now be described, by example only, with reference to the accompanying drawings, wherein

Figure 1 is a schematic illustration of a user holding a mobile terminal in one hand close to the user's head;

Figure 2 is a schematic illustration of a user holding a mobile terminal between the user's head and shoulder;

Figure 3 is a schematic illustration of a user holding a mobile terminal in one hand close while the user is also gripping the steering wheel with the hand;

Figure 4 is a schematic illustration of a mobile terminal in which the embodiments of the present invention can be implemented.

Figure 5 is a flowchart diagram illustrating the process of detecting that a mobile terminal is held between the user's head and shoulder, according to an embodiment of the present invention;

Figure 6 is a flowchart diagram illustrating the process of detecting that a mobile terminal is held as shown in Figure 3 according to another embodiment of the present invention;

Figure 7 is a schematic outline of a system for determining whether a vehicle's driver is using a mobile terminal in a voice call while driving according to another embodiment of the present invention;

Figure 8 illustrates a section of a mobile terminal taken along the line VIII-VIII of Figure 4; and

Figures 9A and 9B are force diagrams illustrating the force exerted on a clamshell mobile phone held in the position of Figure 2.

Figure 4 is a schematic illustration of a mobile communications terminal in which the present invention can be implemented. Such a terminal 100 comprises means (not shown) for communicating with other devices via a mobile communications network, for example a cellular network. The front surface 101 of the terminal 100 includes a screen 103 for displaying information to the user of the terminal and keys 104 for operating the terminal.

A mobile terminal as illustrated in Figure 4 is often held in one hand beneath the user's head if the user communicates with a second user via a voice call. Hand-free kits are provided such that a user can operate the mobile

terminal without needing to hold the terminal in one hand. Such a hands-free mode is especially useful for a driver using the terminal in a vehicle while driving a car.

Many users do not use hands-free mode of their mobile communications terminals when they are driving. Instead, they hold the mobile terminal in one hand, as is illustrated in Figure 1. However, it is difficult to reliably operate a vehicle with one hand. For example, it is sometimes necessary for the driver to operate a vehicle's controls with one hand while steering the car with the other hand. There are two ways commonly used to handle such a situation while the driver is communicating via a mobile terminal.

A driver may hold the mobile terminal by tilting the head and/or lifting a shoulder, so that the phone is squeezed between the head and the shoulder, as is illustrated in Figure 2. The driver has then both hands available for controlling or operating the car. If the user is holding the mobile terminal in this way, he or she may even continue an ongoing voice call, although the user has no hands available for holding and operating the mobile terminal.

Alternatively, the driver may keep holding the mobile terminal in one hand, but removing the mobile terminal from the position close to the user's ear to reach for the steering wheel or control the vehicle. The user then holds the mobile terminal with one hand and at the same time operates the vehicle's controls or steering wheel with the same hand. This position is illustrated in Figure 3. In this case the mobile terminal is relatively far away from the

user's head. Thus the user is usually no longer able to hear the other party's voice in a call and he most often does not continue to speak in an ongoing call.

In the following it will be described how these two situations can be detected.

Detecting a Mobile Terminal held between the User's Head and Shoulder

In one embodiment of the present invention, the mobile terminal is adapted to detect that the mobile terminal is held between the user's head and shoulder as shown in Figure 2. This can be achieved by one or more sensors sensing pressure exerted on the mobile terminal by the head and/or shoulder.

One characteristic of such pressure is that the pressure is distributed over a larger area of the front and/or back of the mobile terminal's casing. In contrast, if the mobile terminal is operated or held in one hand in the normal way as depicted in Figure 1, the pressure of holding the terminal is mainly focused on the sides of the mobile terminal, and the pressure exerted on the front and/or back of the mobile terminal's casing is point-like rather than distributed over a larger area.

Another characteristic of such pressure caused by holding the mobile terminal in a position as illustrated in Figure 2 is that the pressure is exerted over a certain period of time. During this time period the pressure is relatively constant. If, on the other hand, the mobile terminal is squeezed from the front or back by accident, for example by letting the phone drop on the floor, the pressure is exerted only for a moment.

There are several possibilities to detect pressure of the described characteristics in order to determine that the mobile terminal is held is a position as shown in Figure 2.

Touch Sensing

If the mobile terminal is being held in a position as shown in Figure 2, pressure may for example be sensed by piezo electric elements, by strain gauge elements incorporated in the case of the mobile terminal or by silicon pressure transducers.

The pressure can be measured either directly or by measuring a deformation of the mobile terminal case. According to one embodiment of the present invention, the pressure sensors are positioned on the front and on the back of the mobile terminal casing. The pressure exerted by compressing the casing from the front and the back is directly detected by the sensors.

In another embodiment sensors are only used on the front surface of the casing, as is illustrated in Figure 4. Piezo-electric elements 105 are arranged in the button spaces of the keypad on the front surface 101 of the mobile terminal 100.

Alternatively, operational elements such as the buttons of the keypad itself or a touch-sensitive screen can be used to detect pressure exerted on the mobile terminal. A touch screen provides position data, but no quantitative information about the pressure exerted on the screen. Touch-screens based on resistive sensors, on capacitive sensors or on Surface Acoustic Wave (SAW) sensors are all suitable for this application.

Resistive sensors rely on two insulating films with a thin insulating gap between them. The inside faces of the films are coated with a thin conductive layer. An external force will tend to make the conductive layers touch. Because of their thinness, the path from one film to the other will have electrical resistance. The further the point of contact is from an edge, the greater the resistance of that path. By measuring the resistance from orthogonal edges, X and Y coordinates to the centre of conductivity can be obtained. By measuring paths from all edges and between opposite edges, an estimation of the area of contact can be obtained, as well as it's arithmetic centre. There is no reliable means of detecting how hard the pressure is; only that it is hard enough for contact to be made.

Capacitive sensors can work in several different ways, but all have the same basic construction. An insulator has a conductive pattern deposited on one side. This forms one plate of a capacitor. The other plate is formed by the human body, which can be assumed to be grounded. Driving each plate in turn with a high frequency signal allows the capacitance to be measured. Plating an insulating layer and then another conductive layer makes the system more versatile and more sensitive, as variations in capacitance can be measured. Point resolutions much finer than the grid can be interpolated. Area and shape measurements are inherently available.

SAW sensors rely on an array of acoustic drivers and receivers. Touching the surface of the screen either reduced the sound level past that point, or produces an echo. Either the transmitted sound level can be

measured, or echoes can be listened for. By having an array of senders either working one at a time, or all working with different tones, the position and outline of an obstruction can be measured..

Suitable touch-screens are commercially available, for example from 3M Touch Systems or TScreens.

If a plurality of buttons distributed over a contiguous area or an area of a predetermined size are actuated simultaneously, or for a touch screen phone the touch-sensitive screen is activated over an area of a predetermined shape or extent, this can be used as an indication that the mobile terminal is held in a position as shown in Figure 2. No additional sensors are needed in order to implement this embodiment.

According to yet another embodiment the pressure sensors can be positioned in any other suitable position on the mobile terminal casing. Exerting pressure onto the front and/or back surface of the mobile terminal casing causes a deformation of the casing, such as a lateral extension. Suitable positions for sensors may therefore also be side faces of the case. This is illustrated in Figure 8. Figure 8 illustrates a section taken along the line VIII-VIII of Figure 4. The solid line shows the case if no pressure is exerted, the dashed line illustrates the deformation of the case if pressure is exerted on the case from the front and the back surface as indicated by the arrows. Referring again to Figure 4, the position of a strain gauge sensor 106 on the side face 102 of a mobile terminal 100 is indicated. Depending on the

structure of the case, suitable positions may be chosen for each design of a case. Strain gauge elements are particularly suitable for this embodiment.

The classical construction of a (extensoresistive) strain gauge element consists for example of a thin Constantan (Cu:55%, NI:45%) grid-like sensor that is photo-etched and glued upon a thin polymer backing film. By properly cementing the backing film of the above arrangement upon the surface of a test sample, it thus becomes a means to infer the strain experienced by the surface from a simple resistance measurement. Titanium Nitride (TiN) coatings can also be used. Strain gauge pressure sensors suitable for the above described system are commercially available, for example from ERA Technology Ltd or Dynasen Inc.

According to one embodiment of the present invention, strain gauge elements can be directly applied to the inner surfaced of the casing of the mobile terminal, such as moulded plastic casings. The elements can be applied to the case by printing methods using conductive ink. If the mobile terminal comprises belt clip or the like, a strain gauge element can be fitted in the belt clip as a direct pressure sensor can measure the pressure of the clip against the phone body.

According to yet another embodiment characteristic sounds which are emitted when the mobile terminal case, for example made of plastics, is deformed. Microphones detect the sounds and a signal analysis based on digital signal processing is used to detect the characteristic sound.

In the following detection methods are described suitable for other types of mobile terminals, such as a Personal Digital Assistant (PDA) type or a clamshell mobile terminal.

Detecting that a PDA type mobile terminal is held between the user's head and shoulder is similar to the methods described above. However, contact with the display surface exists in normal use. Thus, additional sensing techniques or sensors are required to differentiate between the normal use and a squeezing between the user's head and shoulder. This can be achieved, for example, by measuring the amount of pressure along the mobile terminal's z-axis (i.e. perpendicular to the terminal's front or back surface) or by providing additional sensors of the types described above to measure the pressure on the back surface of the terminal, or by monitoring the changes in the shape and size of the touched area of the display surface.

A clamshell type mobile terminal usually includes two portions which are rotatably mounted via a hinge such that the terminal can be folded in it's closed position and can be opened for operation of the phone. Detecting that a clamshell type mobile terminal is held between the user's head and shoulder is generally very similar to detecting the same position on an ordinary terminal. The same sensing methods can be applied.

However, a further possibility to detect the position shown in Figure 2 is to monitor the pressure on the hinge in its open position. Figure 9A illustrates the force diagram for holding a clamshell type phone between the user's head and shoulder. If the user presses with the shoulder against the

phone on or near the hinge and with the ear and cheek against the two ends of the phone, an enhanced pressure is exerted on the hinge of the phone, which can be sensed. However, the position depicted in Figure 9A is likely to be unstable and uncomfortable for the user for most designs of the mobile terminal. The terminal would need to be designed to balance two points of contact on the open face with one point of contact on the rear face. For other clamshell type mobile terminals the terminal will be held as illustrated in the force diagram of Figure 9B, in which the force of the head (close to the ear) balances the force of the shoulder. In this case the same sensors as described above for an ordinary terminal can be used, although the position of the sensors might be varied and a position suitable for each design may be chosen according to the force exerted on the phone.

The detection methods described above may be combined with a measurement of the time period the pressure is detected to distinguish whether the mobile terminal is held between the user's head and shoulder or whether the pressure is exerted accidentally. A suitable time period may be, for example, 2 to 3 seconds.

The detection of a user holding the mobile terminal between the user's head and shoulder according to one embodiment is illustrated in Figure 5. The flowchart diagram starts in step 201. In step 202 it is checked whether a call is ongoing. If not, the procedure is ended in step 215. If the mobile terminal is in a call, the process continues with step 203. In step 203 a pressure is sensed in a first pressure sensor and the information is transmitted

to a processor. The processor then checks whether a second sensor has also sensed pressure in step 205. If not, the processor then checks whether the touch-screen of the mobile terminal is activated over an area of a predetermined size. If not, the processor continues in step 209 and determines whether more than one key of the key pad is pressed. If this is not the case, the processor then determines the time period the pressure sensor 1 has detected pressure (step 211). If the time period is smaller than a predetermined time t, the processor determines that the mobile terminal is not held in a position as detected in Figure 2 (step 215). On the other hand, if any of the queries of step 205 to 211 are answered in the affirmative, the processor determines in step 213 that the mobile terminal is most likely squeezed between the user's head and shoulder.

Detecting a Mobile Terminal held close to the Vehicle's Controls

In the following the detection of a user holding the mobile terminal as illustrated in Figure 3 will be described.

Generally, there are two different possibilities which cause this situation to be detected. Either the position itself is detected, i.e. the position in which the mobile terminal is in close proximity to the vehicle's controls or steering wheel, or the movement is detected which is required to bring the mobile terminal towards that position, i.e. a movement of the mobile terminal in addition to the motion caused by the moving vehicle. It is apparent that the two detection methods can be combined easily.

The proximity of the mobile terminal to the vehicle's controls or steering wheel can for example be detected with a radio frequency (RF) resonator detection system. According to one embodiment, the mobile terminal emits RF waves and the steering wheel and control panels include an RF resonator. The mobile terminal is adapted to detect the RF emitted by the resonator. In this way the mobile terminal can detect that it is in close proximity to the vehicle's controls or steering wheel. It is understood that other passive or active RF proximity methods can be used alternatively or in addition.

Alternatively, the strength of the radio signals emitted by the mobile terminal in the course of a call can be used for detection. In this case elements measuring the original strength of the radio signal can be implemented in or close to the vehicle's controls. Alternatively, or in addition, a sudden change in the strength of the radio signals can be detected in the mobile terminal.

The results of the measurements performed in the control panel or elsewhere outside the mobile terminal can then be communicated to the mobile terminal using a short-range wireless link like, for example, the systems of the Infrared Data Association (IrDA), Bluetooth™ or the IEEE802.15.4 Working Group for Wireless Personal Area Networks (WPAN™). IrDA protocols allow a communication or data exchange via a short-range radio link between two devices over a distance of 1 to 2 meters. Bluetooth is another system of short-range radio communication, suitable for voice and data, transceiving via a globally available frequency band of 2.4

GHz. The WPAN™ Working Group addresses wireless networking of portable and mobile devices, allowing these devices to communicate and interoperate with one another. The solution investigated by the WPAN™ Task Group 4 is a low data rate solution with very low complexity and very low energy consumption. It is intended to operate in an unlicensed, international frequency band.

Other proximity measurement methods known in the art, such as capacitive proximity measurements, can be applied alternatively or in addition to the methods described above.

A capacitive proximity sensor works according to the same principles as described above for the capacitive sensors. Suitable proximity sensors are, for example, available from Qtouch™.

A movement of the mobile terminal (within the moving vehicle) can be detected using acceleration sensors or gyroscopic methods. The acceleration can also be detected directly using the acceleration in the mechanical part of the mobile terminal together with sensors, such as pressure sensors, sensing the acceleration.

Figure 6 is a flowchart diagram illustrating the method of detecting that a user is holding his mobile terminal close to the vehicle's steering wheel or controls as illustrated in Figure 3.

Similar to the procedure described above with reference to Figure 5, in it is first checked in step 302 whether a call is ongoing. If a call is in progress, a processor is monitoring the mobile terminal's acceleration in step 303. If the

sensors do not detect an acceleration, the acceleration is again monitored in step 303. However, if a movement of the mobile phone towards the car's controls is detected using the acceleration sensors in step 305, the processor checks whether the mobile terminal is in close proximity to the vehicle's steering wheel or controls (step 307) by the methods described above. If the answer is in the affirmative, the processor determines that the mobile terminal is in a position as shown n Figure 3 (step 311). It may happen that no close proximity is detected in step 307 although the mobile terminal is indeed close to the vehicle's controls. Therefore the processor checks in step 309 whether a sudden absence of speech occurs during the ongoing voice call for a predetermined time period t'. If this is the case, the processor has again determined that the mobile terminal is in a position as shown in Figure 3. Otherwise the processor concludes that the acceleration detected in step 303 could not have been originated from the user moving his mobile terminal towards the vehicle's control and the process is ended in step 313.

However, the method described above needs to be combined with other information known in the art in order to reliably alert a user that he is using a mobile terminal for a voice call while driving a vehicle.

Suitable information includes, for example, whether the mobile terminal is in an ongoing voice call and whether the vehicle is moving. The former information can be obtained directly from the mobile terminal by monitoring the signals transmitted and/or received by the mobile terminal. The latter information can be obtained using methods such as the Global

Positioning System (GPS) by monitoring the mobile terminal position and change of position with time or directly from the vehicle's control and communication to the mobile terminal, for example via a short-range radio link.

By combining the information with the method described above, the system can reliably detect that a vehicle's driver is using a mobile terminal in a voice call whilst driving. An appropriate action can be taken such as issuing an audio warning or disabling voice calls.

According to one embodiment, such a system may be included directly in a mobile terminal, as will be described in the following with reference to Figure 7. The system includes first and second pressure sensors 402 and 404, respectively, a proximity sensor 406 and an acceleration sensor 408. The information obtained from these sensors are communicated to a processor 410. The processor 410 can obtain further information such as activation of keys or a touch-sensitive screen from the mobile terminal controls 412 or from mobile terminal communications interfaces 414. All above described elements are included in mobile terminal 400. Information from outside the mobile terminal 400 is communicated to the mobile terminal processor 410 via a short-range wireless link, such as a IrDA, a Bluetooth or a IEEE802.15.4 link. A car processor may, for example, communicate information from proximity detectors positioned in the vehicle's control to the processor 410. A short-range radio link may also be established directly from a car's processor 430 to the mobile terminal processor 410 in order to communicate

information about the motion of the vehicle, such as whether the vehicle is in motion or the current velocity of the vehicle.

The mobile terminal processor 410 can then put all available information together. If the processor determines that the vehicle is moving and a voice call is in progress, the processor then determines whether the mobile terminal is held in an unusual position by the methods described above, for example with the procedures explained above with reference to Figures 5 and 6. The mobile terminal processor 410 can then take appropriate action as described above or can communicate the information about the detected condition to a another system, such that action can subsequently be taken.

Whilst in the above described embodiments a system is described for detecting that a vehicle driver is using a mobile communications terminal while the vehicle is in motion including the step of detecting that the mobile terminal is used in an unusual position, it is appreciated that the detection of a user holding the mobile terminal in a way other than holding the terminal in one hand beneath the user's head can alternatively be used in other circumstances and for other purposes. The mobile terminal may for example be adapted to detect that the user is squeezing the mobile terminal case between the user's head and shoulder and vary the volume of the speaker and/or microphone accordingly, for example by reducing the volume of the speaker. This might be especially useful if the mobile terminal was used in the speakerphone mode before.

Alternatively, if the mobile terminal detects that it is moved away from beneath the user's head the mobile terminal may for example adjust the volume of the speakerphone such that the user may nonetheless be able to hear the voice of the second party in an ongoing voice call.

Whilst in the above described embodiments it is described that the system is included in the mobile terminal, it is appreciated that a system as described above can be provided alternatively as a separate system or be included in the vehicle. In this case the information sensed in the mobile terminal, such as the pressure and/or strain exerted on the mobile terminal case or the acceleration of the terminal, is communicated to the external system, for example by a short-range wireless link.

It is to be understood that the embodiments described above are preferred embodiments only. Various features may be omitted, modified or substituted by equivalents, without departing from the scope of the present invention, which is defined in the accompanying claims.

CLAIMS:

1. A method for detecting that a vehicle driver is using a mobile communications terminal while the vehicle is in motion, the method comprising the steps of

i) determining that a voice-call is in progress;

ii) determining that the vehicle is in motion; and

iii) detecting that the mobile terminal is used in an unusual position.

2. A method according to claim 1, wherein the mobile terminal is held between the user's head and the user's shoulder in said unusual position.

3. A method according to claim 2, wherein pressure exerted on the mobile terminal's front and/or back surface is detected.

4. A method according to claim 3, wherein said pressure is detected by at least one of the following methods:

i) sensing pressure on the front and/or back of the mobile terminal;

ii) sensing pressure or strain on the side of the mobile terminal casing;

iii) determining simultaneous activation of more than one key on the front and/or back surface of the mobile terminal; and

iv) determining activation of a touch-sensitive screen over an area of a predetermined extent.

5. A method according to claim 3 or 4, wherein pressure is sensed with sensors comprising piezo elements and/or silicon pressure transducers.

6. A method according to claim 3, 4 or 5, wherein strain is sensed with sensors comprising strain gauge elements.

7. A method according to claim 1, wherein the mobile terminal is held in the user's hand close to the vehicle's controls and/or the vehicle's steering wheel in said unusual position.

8. A method according to claim 7, wherein said unusual position is detected by detecting that the mobile terminal is in close proximity to the vehicle's controls and/or steering wheel.

9. A method according to claim 8, wherein said close proximity is detected using capacitive proximity sensors and/or proximity sensors based on microwave emission and microwave resonators.

10. A method according to claim 8 or 9, wherein said close proximity is detected using radio signals emitted and/or received by said mobile terminal.

11. A method according to claim 8, 9 or 10, wherein a system for detecting said small distance is included in said mobile terminal.

12. A method according to claim 8, 9 or 10, wherein a system for detecting said small distance is included in the vehicle's control panel.

13. A method according to claim 12, wherein said system included in the vehicle's control panel communicates with the mobile terminal.

14. A method according to claim 1, wherein the mobile terminal is moved away from beneath the user's head in said unusual position.

15. A method according to claim 14, wherein the movement of moving away the mobile terminal from beneath the user's head is detected with acceleration sensors.

16. A method according to any preceding claim wherein the Global Positioning System (GPS) is used to determine that the vehicle is in motion.

17. A method according to any preceding claim, wherein a system included in the vehicle communicates the information that the vehicle is in motion to the mobile terminal.

18. A method according to claim 13 or 17, wherein the communication between said system and the mobile terminal is performed using a short-range wireless link.

19. A method according to claim 18, wherein said wireless link is an IrDA, a Bluetooth™ or a IEEE802.15.4 link.

20. A method of determining the way a user holds a mobile terminal by detecting pressure on the case and/or on operational elements of a mobile terminal.

21. A method according to claim 20, wherein it is detected whether a user holds the mobile terminal between the user's head and shoulder.

22. A method of determining a change in the way a user holds a mobile terminal by detecting a movement of a mobile terminal.

23. A system adapted to perform any of the methods of claims 1 to 20.

24. A system for detecting that a user of a mobile communications terminal holds the terminal in a position other than with a hand close to the user's head, the system comprising:

at least one sensor for sensing the pressure exerted on the mobile terminal; and

a processor for processing the information obtained from said at least one sensor.

25. A system according to claim 24, further comprising a proximity sensor for sensing the proximity of said mobile terminal to other devices.

26. A system according to claim 24 or 25, further comprising a motion sensor for sensing a movement of the mobile terminal.

27. A system substantially as hereinbefore described with reference to the accompanying drawings.

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Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

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Other: Online: EPODOC, WPI, JAPIO

Documents considered to be relevant:

Category	Identity of document and relevant passage		Relevant to claims
X	US 6353778 B1	(BROWN) - Whole document	1, 2, 7, 14, 17, 18, 19
X	GB 2358108 A	(NOKIA) - Whole document	1, 2, 7, 8, 11, 14,
A	GB 2350430	(NEC) - Whole document	

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